**Cost and benefit analysis of sorghum and maize production with and without contour bunding**

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**Methodology**

We use the partial budget method for the cost and benefit analysis of sorghum and maize production with and without contour bunding system. Partial budget analysis is a simple and effective technique for assessing the profitability of new technology on farm. It provides the foundation for comparing the relative profitability of alternative treatments, and shows the effect of changes in farm operations. For example, the farmers know that application of contour bunding system will likely increase the yields, and thus the gross income. The use of this system also results in additional costs. To decide whether to use contour bunding system for maize production or not requires a cost-benefit analysis through partial budget method. The method is applied on a sample of 82 sorghum farmers and 56 maize farmers interviewed through a field survey conducted in 2016 in Koutiala district. Partial budget method goes through many steps. For the purposes of the study, we focus on the description of the steps that will be used in this analysis.

* Yield: the quantity of output (such as maize or sorghum) produced per unit area. Yield is usually expressed in kg/ha.
* Adjusted yield: it is the experimental yield scaled down by a given proportion to approximate the yield that farmers can obtain on their farms. The scaling down is necessary to prevent overestimation of the returns that farmers are likely to obtain from a treatment. Experimental yields are higher than farmers’ yields because of higher management level, smaller plot size, precision in harvesting date, and better harvesting methods. The difference between yields from experimental fields and those from farmers’ fields in similar cropping conditions will be the basis for the scaling down.
* Farm gate price of the output: the value (price) that farmers receive or can receive for their harvested crops. By this definition, it is the price farmers receive at the end of the production process.
* Gross farm gate benefit: it is the product of the farm gate price of the output and the adjusted yield.
* Total variable input costs: the sum of all variable input costs and varies from one treatment to another. These are farm gate costs of the variable inputs for each of the treatments.
* Net benefit: the difference between the gross farm gate benefit and the total variable input cost.
* Marginal rate of return: this is a ratio of the change in net benefits to change in total variable input costs between treatments.

**Results**

The results derived from partial budget analysis for the maize production with and without contour bounding system (table 1) show that the two treatments are benefit for the smallholder farmers of maize. The maize production with contour bunds generate a net benefit estimated to about FCAF 645,334 per hectare with the costs production estimated to almost FCFA 122,699. The production without contour bounding generates a net benefit estimated to about FCFA 450,627 per hectare with the costs production of FCFA 102,671. The net benefit generated by the production with contour bounding is about 43% higher than that generated without contour bonds. The marginal rate of returns of changing from treatment without contour bounding system to treatment with contour bounding system is 9.72. This means that a farmer’s investment of FCFA 1 in the application of contour bounding system on maize recoups the FCFA 1 and gives an additional FCFA 9.72.

The results derived from partial budget analysis for the sorghum production with and without contour bunding system (table 2) show that the two treatments are benefit for the smallholder farmers of sorghum. The sorghum production with contour bunds generates a net benefit estimated to about FCAF 149,400 per hectare with the costs production estimated to almost FCFA 39,600. The production without contour bounding generates a net benefit estimated to about FCFA 120,665 per hectare with the costs production of FCFA 34,000. The net benefit generated by the sorghum production with contour bunding is about 24% higher than that generated without contour bunds. The marginal rate of returns of changing from treatment without contour bunding system to treatment with contour bounding system is 5.13. This means that a farmer’s investment of FCFA 1 in the application of contour bunding system on sorghum recoups the FCFA 1 and gives an additional FCFA 5.13.

Table 1: Partial budget for maize production with and without contour bounding system.

|  |  |  |
| --- | --- | --- |
|  | Without Contour Bunding | With Contour Bunding |
| ***Gross farm gate benefits*** |  |  |
| Average grain yield (kg/ha) | 2753 | 3718 |
| Average residue yield (kg/ha) | 3800 | 5792 |
| Adjusted grain yield (kg/ha) | 2478 | 3346 |
| Adjusted residue yield (kg/ha) | 3420 | 5213 |
| Grain price (FCFA/ha) | 175 | 175 |
| Residues price (FCFA/ha) | 35 | 35 |
| Gross farm gate benefits (FCFA/ha) | 553298 | 768033 |
| ***Variable input costs (FCFA/ha)*** |  |  |
| Compost | 17750 | 17750 |
| Seeds | 9845 | 9845 |
| Harvest bags | 2674 | 3145 |
| Urea | 25295 | 25295 |
| labour | 8342 | 8482 |
| DAP | 13760 | 13760 |
| Pesticide | 2505 | 2422 |
| Workforce | 22500 | 42000 |
| Total variable input costs (FCFA/ha) | 102671 | 122699 |
| ***Net benefit*** |  |  |
| Net benefit (FCFA/ha) | 450627 | 645334 |
| Change in net benefits between two consecutive treatments (FCA/ha) |  | 194708 |
| Change in total variable input costs between two consecutive treatments (FCFA/ha) |  | 20028 |
| ***Marginal rate of return*** |  |  |
| Marginal rate of return |  | 9,72 |

Table 2: Partial budget for sorghum production with and without contour bounding system.

|  |  |  |
| --- | --- | --- |
|  | Without Contour Bunding | With Contour Bunding |
| ***Gross farm gate benefits*** |  |  |
| Average grain yield (kg/ha) | 1076 | 1308 |
| Average residue yield (kg/ha) | 1245 | 1550 |
| Adjusted grain yield (kg/ha) | 968 | 1177 |
| Adjusted residue yield (kg/ha) | 1121 | 1395 |
| Grain price (FCFA/ha) | 125 | 125 |
| Residues price (FCFA/ha) | 30 | 30 |
| Gross farm gate benefits (FCFA/ha) | 154665 | 189000 |
| ***Variable input costs (FCFA/ha)*** |  |  |
| Compost | 5500 | 6000 |
| Seeds | 2400 | 2400 |
| Harvest bags | 2500 | 3000 |
| Urea | 16700 | 17500 |
| labour | 2200 | 3700 |
| Workforce | 4700 | 7000 |
| Total variable input costs (FCFA/ha) | 34000 | 39600 |
| ***Net benefit*** |  |  |
| Net benefit (FCFA/ha) | 120665 | 149400 |
| Change in net benefits between two consecutive treatments (FCA/ha) |  | 28735 |
| Change in total variable input costs between two consecutive treatments (FCFA/ha) |  | 5600 |
| ***Marginal rate of return*** |  |  |
| Marginal rate of return |  | 5,13 |